

677-4

ACCESSORIES  
FOR  
MOVABLE BRIDGES

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ELECTRIC CROSSING GATES  
WARNING SIGNALS, Roadway & River  
GASOLINE ENGINE UNITS  
NAVIGATION LIGHTS  
LIMIT SWITCHES  
BENCH BOARDS



NORWOOD-NOONAN CO.  
CHICAGO, ILL.



NORWOOD - NOONAN CO.



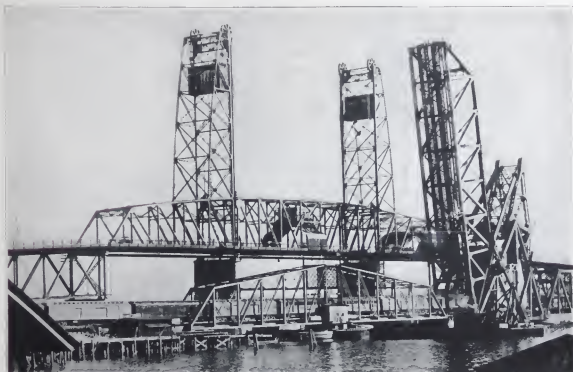
CHICAGO, ILLINOIS, U. S. A.

MANUFACTURERS OF

## Accessories for Movable Bridges

ELECTRIC CROSSING GATES  
BRIDGE AND PIER LAMPS  
GASOLINE ENGINE UNITS

LIMIT AND FOOT SWITCHES  
ROADWAY WARNING SIGNALS  
RIVER WARNING SIGNALS  
BENCH CONTROL BOARDS



*Three types of movable bridges over St. Johns River, Jacksonville, Florida. This photo taken just before the swing span was floated away to allow the new 216-foot bascule span, built by the Florida East Coast Ry. Co., to be lowered. The Norwood-Noonan Company installed the complete electrical equipment on the new bridge.*

### Consulting Engineers

We will prepare complete specifications and wiring diagrams and other plans needed for the Electrical Equipment for any type of Movable Bridge. *Maintenance reports* made on existing bridges covering electrical and mechanical equipment.

### Contracting Engineers

We are prepared to install the complete electrical equipment for any type of movable bridge for a railroad or municipality in any part of the United States.



## Foreword

In compiling these bulletins this Company is offering the accumulated experience of nineteen years specialization in the electrical and mechanical equipment for movable bridges. It has to its credit some one hundred and fifty installations ranging from the smallest span, Cypress Creek, Virginia and Sassafrass, Maryland for passage of oyster boats, to the largest Newark Bay Bridges and two Willamette river crossings in Portland, Oregon for the passage of large ocean steamers. We number among our customers twenty-five railroads and forty or more municipalities. For this reason we feel that we are offering the most modern and thoroughly tried-out equipment for this highly specialized branch of bridge building and operation.

In the past our efforts were devoted entirely to the field construction end but it later developed that, due to the special nature of the work, a shop became necessary. Since January 1st, 1926 we have ample shop facilities to care for the present demands.

In the past two years we have been called upon in a consulting capacity to prepare plans and specifications covering the electrical equipment for movable bridges and now have a thoroughly organized *Engineering and Drafting Department* that is prepared to handle various bridge problems.

The most recent addition to our organization is a *Service Department*. The object of this Department is to handle maintenance and repairs. Arrangements are made for annual or semi-annual inspection of electrical and mechanical equipment and a complete report made with detail drawings of replacements where necessary. This Department is also prepared to handle application of power (gasoline or electric) to existing hand operated bridges including necessary machinery.

NORWOOD NOONAN COMPANY.

NORWOOD - NOONAN CO.



CHICAGO, ILLINOIS, U. S. A.

JANUARY, 1927

BULLETIN No. 2

# N-N Electric Crossing Gate



FOR RAILROAD HIGHWAY  
GRADE CROSSINGS AND  
BRIDGE APPROACHES

Protection for the Public

Insurance for the User

NORWOOD - NOONAN CO.



CHICAGO, ILLINOIS, U. S. A.

# The Electric Crossing Gate

For protecting the public at railroad highway grade crossings and bridge approaches, the electric crossing gate is rapidly taking the place of all other types.

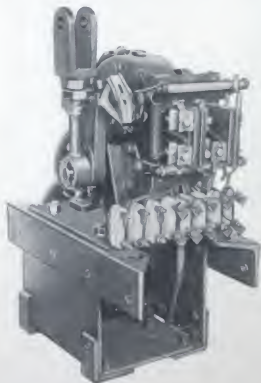
With highway traffic constantly increasing in volume and speed, it is more important than ever before to have fast, reliable gates at crossings — gates capable of standing up under most severe 24-hour service.

The N-N Electric Crossing Gate has been designed to meet the requirements of present day usage.

Due to its rugged construction this gate easily handles roadway arms up to 50 feet in length, with an additional 18-foot sidewalk arm. We have records of gates operating 400 times daily on a railroad crossing.

In order to have the fastest practical operation for varying lengths of roadway arms, it is furnished in four models, the chief difference being speed of operation.

A specially designed limit switch limits the gate's travel in each direction and may also handle gate warning signals—indication lights or interlocking circuits, if desired.



OPERATING MECHANISM  
SIDEWALK SIDE

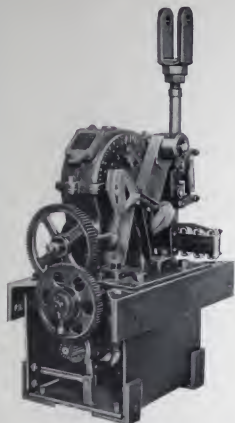
## *Distinctive Features of This Gate Are:*

- Ruggedness of design.
- Speed of operation.
- Accessibility of all working parts.
- Operating mechanism removable as a unit.
- Limit switch: Fast breaking, handles services up to 500 volts D. C.
- Lubrication: Bearings not running in oil provided with Alemite fittings or grease cups.
- Worm gear: Entirely enclosed and fitted with ball thrust bearings.
- Motor: Heavy industrial—may be reversed by plugging at any intermediate position of gate arms.
- Reversing drum controller part of standard equipment.
- Performance and low cost of maintenance of over 100 of these gates operating in the United States and Canada have made the N-N Crossing Gate popular with every customer.

## DESCRIPTION

The operating mechanism consists of an electric motor, a train of spur gears, a worm gear reduction and a limit switch.

An adjustable steel connecting rod links a crank on the worm gear shaft to a crank on the roadway arm shaft and the sidewalk arm is in turn driven by linkage from the roadway arm.



OPERATING MECHANISM  
ROADWAY SIDE

The gate arm shafts are annealed steel castings carried in babbbitted bearings in the case.

The case is of heavy cast iron and is made practically dust-proof by gaskets around the openings. A large door on each side makes all parts of the operating mechanism accessible for inspection and adjustment.

The motor is mounted on the lower plate of the operating mechanism frame and may be removed independently.

If desired, an electric bell (No. 55) may be mounted on the gate cover, thereby saving the expense of an additional support.

The worm gear is entirely enclosed, operates in oil and has a low-tooth pressure. Both ends of worm shaft are fitted with ball bearings. The reduction through the worm gear is 44 to 1.

Slow moving bearings are fitted with grease cups or Alemite fittings as desired.

Approximate weight of gate post crated for shipment 1,600 pounds.

### *Specifications*

MODEL	OPERATING TIME	MOTOR	MAX. ARM
N-N 7	7 Sec.	$\frac{1}{2}$ HP	18 Ft.
N-N 9	9 Sec.	$\frac{1}{2}$ HP	30 Ft.
N-N 11	11 Sec.	$\frac{3}{4}$ HP	42 Ft.
N-N 13	13 Sec.	$\frac{3}{4}$ HP	50 Ft.



## OPERATION

One-half revolution of the worm gear crank operates the gate arms through their entire travel of either  $90^\circ$  or  $75^\circ$ . With some installations  $75^\circ$  is desirable where a vertical arm would interfere with wires overhead.

By having the worm crank turn through  $180^\circ$  the gate arm is started and brought to rest with no undue shocks. This cushioning effect is so marked that only on the largest model has a buffer been found necessary to support the outer end of the arm.

The worm gear being the last reduction in the gear train, locks the arms in any position and takes the shock off the smaller high-speed gears if the arms are reversed in mid-position.

A small mechanical brake on the motor shaft prevents the gate overtraveling after the limit switch breaks the motor circuit.

In order to insure a uniform operation the gate arms should be carefully balanced with the counterweights.

The cams which operate the limit switch may be adjusted through an arc of 25 degrees and experimenting will determine their proper location. Should the gate for any reason drift so far past the breaking point of the switch that the circuits are again closed, no damage will be done, for if the worm gear crank is rotated continuously in one direction the gate arms simply continue to travel up and down.



MODEL N-N-13 INSTALLATION  
48-FT. ARM.  $75^\circ$  TRAVEL

## SOME OF THE USERS

### *Railroads*

Southern Pacific Company

Grand Trunk Ry. Company

C., B. & Q. Ry. Company

### *Municipalities*

Chicago

Milwaukee

Seattle

Racine

Tampa

Michigan City

Fort Lauderdale

Miami

Green Bay

St. Augustine

New Orleans

Atlantic City

## WRITE FOR PRICES

Giving requirements as follows:

- A Service available for motor.
- B Length of roadway arm to be used.
- C Length of sidewalk arm if any.
- D Angle of travel desired,  $75^\circ$  or  $90^\circ$ .
- E Wooden arms with gate?
- F Bell mounted on cover?
- G Special circuits required through limit switch:  
Interlocking—Gate lighting—Indicator lights.





NO. 55

## Roadway Warning Signals

### Motor Operated Bell No. 55

THIS bell is recommended as a warning signal for bridge or railroad crossings due to its positive tone and the distance to which it can be heard (1,000 feet). It may be operated on either *alterating* or *direct* current.

The bell is 12" in diameter and is operated through gearing from a motor that is controlled by the operator.

### Vibrating Bell No. 22

This bell is a magnet type and can be used on *direct* current *only*. It is the same general dimensions and appearance as the No. 55 bell though its tone may not be quite as loud. The distance it can be heard clearly is about 800 feet.

Both types of bells are of substantial construction and are weather, bug and dust proof. They are made for the top of a post mounting over the following sizes: 3", 3½" and 4" standard pipe; also for mounting on the side of a house.

In ordering be sure and specify the kind of current and voltage, also the type of mounting desired.

### "Stop" Signal Unit

"STOP" light SL-50-A has a cast iron box, aluminum door casting and letters are sheet brass stencils placed between ruby and ribbed factory glass. Ten 25-watt lights, five on each side, are used for illumination.

This signal is very effective when operated by a flasher.

It can also be arranged for bracket mounting on a trolley pole or arch. Cut shows the SL-50-A signal unit with a No. 22 bell.

Prices on application.

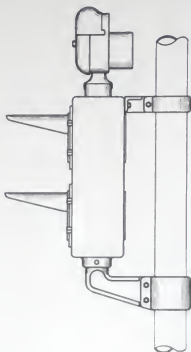


SL-50-A

## Signal Light Unit SL-50



SL-50



SL-50 is designed particularly for bridge approach warning and as shown in the cuts may be mounted on a separate pipe post or it may be mounted on a trolley pole. Both cuts show the application of the No. 55 motor operated bell.

The housing is cast iron with hinged front and removable back. Each light is equipped with a parabolic reflector. A screw adjustment is provided for focusing the lamp. The lenses are  $8\frac{3}{8}$ " diameter and provide a beam 90 ft. wide at 300 ft. The lenses may be red and green or two red. The two red lenses are used when a flashing light is desired, one being on while the other is off. The same flasher is used for flashing the red light on the gate arm.

This type of signal conforms with that now practically standard for congested street crossing, hence the *warning* would be more generally observed.

## Motor Operated Flasher



For bridge warning the flasher is usually mounted on the control panel in operator's house. No cabinet is then required.

When located elsewhere cabinet is necessary.

Rotating drum can be arranged for three to eight circuits.

Specify current and voltage, also number of circuits required.

Prices on application.



## Gasoline Engine Units

Gasoline engine units as shown in this bulletin are complete self contained plants for operating a movable bridge and may be used as a prime mover or to augment electric drives. This unit is designed especially for bridge work and to meet the requirements of the A.R.E.A. specifications for movable bridges. It is of very rugged construction with heavy steel subbase, extra large clutch and a completely enclosed reversing gear case. All units are complete with gasoline tank, radiator, controls and starting motor over 30 H. P., in fact the unit is equipped to place on a bridge bolted down ready for use. The engine and reversing unit are connected with a flexible coupling. Unit shown in Fig. 1 is arranged for remote control; brake and reversing levers as well as spark and gas control is located on another floor.

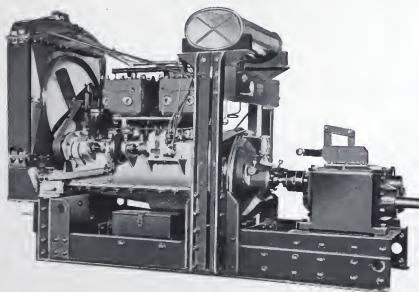


FIG. 1 SPUR GEAR UNIT

**REVERSING GEAR CASE:** These cases are made in two types, the spur gear type with driving shaft parallel to the engine shaft as shown in Fig. 1 and the bevel gear type as shown in Fig. 3 where the driving shaft is perpendicular to the engine shaft. Six sizes of both types are built as shown on sheets 3 and 4. The housing is cast steel with bronze lined bushings, the gears are cast steel and are designed for a low operating tooth pressure. The working parts are self lubricating once the case is properly filled with oil. The speed reductions in the gear cases of the various units are shown on the following sheets. These speeds are the same forward and reverse. The clutch for reversing is of the step type and will not go out of mesh due to an overhauling load. *One of the high points of this unit is the enclosing of the high speed gears and running them in oil.*



FIG. 2 SPUR GEAR CASE

Units are usually furnished without gear reduction other than that obtained through the reversing gear case, however, added gear reduction may be mounted on the sub-base as shown in Fig. 4. This unit was used as a prime mover on a vertical lift span, no electric current being available.

**BRAKES:** These units are not supplied with brakes unless specified. Fig. 3 shows the application of a hand wheel type of brake. The lever and weight type can also be supplied. Brake wheel is made of cast steel and brake shoes are lined with Raybestos. With the weight type of brake the exact braking effort can be predetermined.

**ACCESSORIES:** Standard equipment consists of: Engine complete with pump, carburetor, magneto with impulse coupling on sizes less than 30 H. P., over 30 H. P. starting motor 6 and 12 volt battery and A. C. charger, fan and radiator, dry disc clutch, spark plugs, tool box with special wrenches, a control panel containing gas and spark lever, oil gauge, starting switch and a 10 gal. gasoline tank.

**OILING:** We recommend that the same grade of oil be used in the gear case that is used in the engine filling the case about 1/3 full.

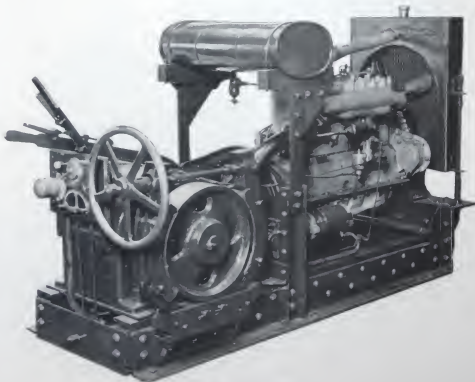


FIG. 3 BEVEL GEAR UNIT

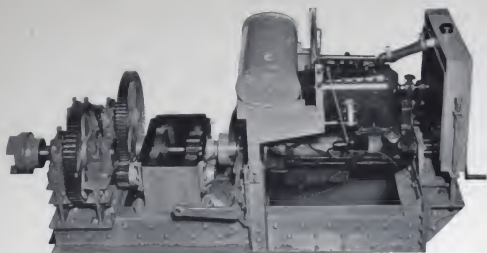


FIG 4 SPUR GEAR UNIT WITH ADDED GEARS

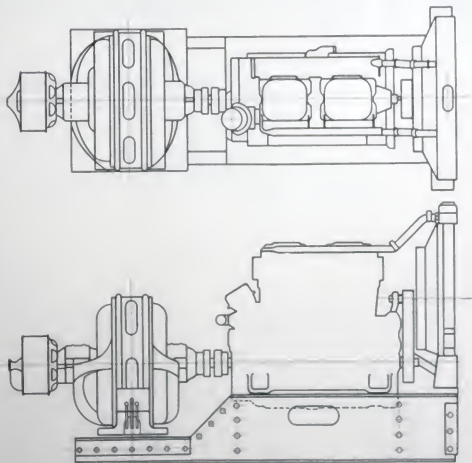


FIG 5 GASOLINE ENGINE DYNAMO SET

## Gasoline Engine Dynamo Units

When it is impossible to use a gasoline engine unit direct geared to the operating machinery for either auxiliary drive or prime mover the use of the engine dynamo set supplying current to electric motors may be used. These sets consist of the same type of engine and accessories as used in the straight gasoline engine unit but in place of the reversing gears a direct connected dynamo is furnished for either A. C. or D. C. with flexible couplings and rheostat. These sets are self contained and are mounted on a substantial structural steel base.

**AUXILIARY DRIVE:** In this case the engine dynamo set supplies current to a smaller auxiliary motor located in the machinery house, the generating set may be located in any convenient place. In event of failure of line supply the auxiliary motor is thrown into mesh with the gear train and the bridge operated with the engine set. Provisions should be made to block up emergency brakes if same are used. With a three or four to one gear reduction from main operating motors bridge may be operated through engine set by throwing in the extra gear reduction and operating at a reduced speed through either one of the main operating motors. This last method eliminates the added auxiliary motor.

**PRIME MOVER:** Where electric current is not available and it becomes necessary to install a double leaf bascule the gasoline engine generating set may be used, located in the operator's house. Care must be taken not to overload the set and the operation of the leaves at a lower speed, than were they driven from public service supply is recommended.

## Gasoline Engine Dynamo Units

TYPE	SPEED	SIZE OF ENGINE	SIZE OF DYNAMO	WEIGHT	FLOOR SPACE
1-D	900 R. P. M.	35 H. P.	20 KW.	2600	3'6"x7'0"
2-D	900 R. P. M.	50 H. P.	25 KW.	3000	3'6"x8'0"
3-D	1200 R. P. M.	60 H. P.	30 KW.	4000	4'0"x9'0"
4-D	1200 R. P. M.	82 H. P.	40 KW.	5000	4'0"x10'0"
5-D	1200 R. P. M.	100 H. P.	50 KW.	6500	4'8"x11'0"

## Recent Installations

### RAILROADS

O. W. R. & N. Company	22 H. P.	T. & P. Ry. Company	25 H. P.
C. & N. W. Ry. Company	45 H. P.	Atlantic Coast Lines	2-20 H. P.
C. B. & Q. Ry. Company	65 H. P.	Atlantic Coast Lines	1-30 H. P.
I. C. Ry. Company	65 H. P.	Atlantic Coast Lines	1-50 H. P.
Wabash Ry. Company	65 H. P.	Florida. E. Coast Ry. Co.	125 H. P.
N. Y. N. H. & H. Ry.	85 H. P.	Boston & Main Ry. Co.	125 H. P.
B. & O. Ry. Company	92 H. P.	Central Ry. of N. J.	2-150, 2-200 H. P.

### MUNICIPALITIES

Yankton, S. D.	20 H. P.	Hackensack, N. J.	2-50 H. P.
Aberdeen, Wash.	42 H. P.	Overbrook, Delaware	20 H. P.
Aberdeen, Wash.	30 H. P.	Tampa, Florida	50 H. P.
New Orleans	30 H. P.	Providence, R. I.	150 H. P.



# Electric Bridge and Pier Lamps



FIG. 1

- Fig. 1 Standard Pier Lamp (red)
- Fig. 1-A Channel Lamp (white)
- Fig. 2 Pivoted Bridge Lamp (red and green)
- Fig. 3 Bridge Lamp Spring Suspension
- Fig. 4 Pivoted Bridge Lamp with Automatic Switch in Head
- Fig. 5 Draw Bridge Lamp
- Fig. 6 360° Pier Lamp (red)
- Fig. 7 360° Bridge Lamp Channel Marker for fixed span (green)

All lamps indicated above except Fig. 5 are made of light gray cast iron and fitted with standard 8" fresnel lenses, are weather proof and are equipped with one standard lamp receptacle (base) unless otherwise specified. Only two 50-watt lamp receptacles can be furnished in each section of these lamps.

Fig. 1 Standard pier lamp with 180° ruby lens with hinged door on the back, ventilated in bottom and holes for 1/2" conduit.

Fig. 1-A Same as Fig. 1 when used as a channel marker for fixed span with exception that the lens is 180° white.

Fig. 2 lamp is the usual mounting for bascule bridge lamps. The lamp always hangs from a pivot in a vertical position. On highway bridges the lamp is usually swung up to the sidewalk by means of a chain for relamping. The length of the pipe stem depends on the height of the railing and distance of suspension point above low iron. This pipe is 2" standard and is not usually furnished, but will be if correct length can be given. The red lens is mounted in the lower half of the lamp and the green in the upper. Hinged doors are provided on the back of the lamp. The pivot bracket pin should be very firmly bolted to the steel work.



FIG. 2





FIG. 3

Fig. 3 lamp is the most desirable mounting for either vertical lift or bascule bridge. The lamp is provided with spring mounting which absorbs all shocks and vibration, thus prolonging the life of the lamp filament. Both ends of supporting rods sheathed with brass sleeves. A platform mounting must be provided for relamping as the lamp is stationary.

The red and green lamps in both Fig. 2 and Fig. 3 are controlled from the limit switch on the main operating machinery so that the light changes from one to the other at predetermined points.

Fig. 4 lamp is essentially similar to Fig. 2 but is provided with a quick break switch in the head. This lamp is particularly adapted to electrifying existing bridges without extra contacts on the limit switch.

Fig. 5 lamp is strictly a draw bridge lamp fitted with 360° white fresnel lens and two opposed 8 3/8" red and green roundels. This lamp is made of heavy sheet metal. Fig. 5 lamp can be furnished in gray cast iron at an addition of \$11.00 to list price.

Fig. 6 lamp is a pier lamp, same as shown in Fig. 1, except that it is equipped with a 360° fresnel lens and top is provided with hinged cover. (This lamp can also be furnished with extra long pipe standard and ladder for lamping.)

Fig. 7 lamp same as number Fig. 6 except that 360° fresnel lens is green. The lamp is used as a channel marker on fixed bridges.

All types of lamps mentioned above meet the United States Lighthouse Bureau requirements.

Dimension prints furnished on application.



FIG. 4

PRICE LIST	
Fig. 1	\$25.00
Fig. 1A	25.00
Fig. 2	63.00
Fig. 3	90.00
Fig. 4	150.00
Fig. 5	34.00
Fig. 6	35.00
Fig. 7	35.00

Add \$2.00 list per base for extra lamp socket

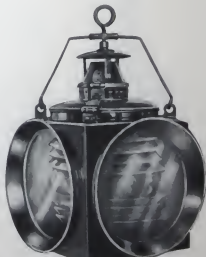
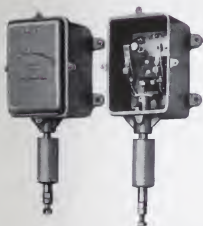


FIG. 5



# Fully Closed Indicating Switch

## Foot Switch



THE applications of this switch are numerous, the principal one however is for an indication and interlock of the completed cycle of any operation on a movable bridge, such as "fully closed" position of a bascule or vertical lift span. The switch is two pole, quick break and will operate within a quarter of an inch variation. This sensitive feature of the switch is desirable for "locking up" a span, for when this switch gives a "closed" indication the lock can be thrown.

Take up or lost motion is provided in a spring buffer immediately below the case and the adjustment is provided by means

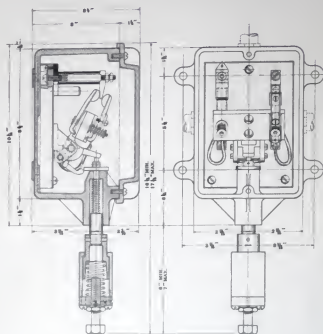
of a set screw and lock nut which is a part of the buffer.

The enclosing case is cast iron, both dust and weather proof and may be mounted out of doors. The customary mounting of this switch is in a vertical position, heavier springs are provided when mounted on the horizontal. Specific instructions should be given when ordering as to the mounting of the switches. Switches are made normally "open" or normally "closed," and *specific instructions should be given on this point in ordering.*

In making application of this switch as a "foot switch" refer to the applications on Page 2.

The layout shown in Fig. 2 is frequently mounted inside the bench board control stand with foot treadle accessible to the operator when operating control levers.

## OVERALL DIMENSIONS



## APPLICATION OF SWITCH

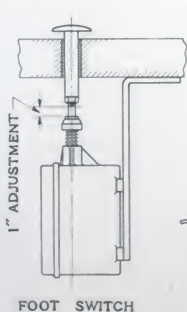


FIG. 1

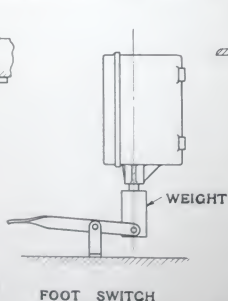


FIG. 2

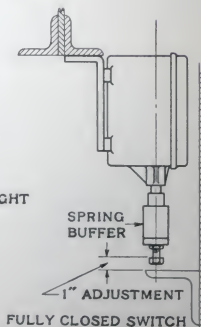


FIG. 3



## Benchboard Control Stands

THE development of the benchboard control is largely due to the "Safety First" movement. On the larger bridge installations they have superceded all other forms of control. The switchboard containing live parts has been eliminated and various operations are handled by remote control, such live parts as are required being mounted on the control panel which is usually located on the floor below the operating floor.

It is not possible to standardize Benchboards but we give herewith several cuts and line drawings showing several types of control. This Company is prepared to design and build any type of benchboard desired.

A benchboard usually contains the following devices:

- Indicator lights for gates and bridge operations.
- Gate control if roadway is clearly visible to operator.
- Selsyn indicators giving position of span.
- Toggle switches and fuses for lighting control and indicating circuits.
- Main motor controller
- Controllers for lock wedges endlift as may be required.
- Rotary voltmeter switch.
- Various push buttons for such as, torque button, bells, horns, etc.
- Foot switch for brake release or limit by-pass as may be required.
- Terminal board for all wiring of benchboard.

**CONSTRUCTION:** Benchboards are usually made of No. 10 gauge sheet iron fastened to a substantial angle iron frame; fuses and terminal connectors are mounted on ebony asbestos.

Fig. 4 shows a benchboard made of 1" ebony asbestos throughout except the back which is white transite board all mounted on angle iron frame. The top of the board is sheet iron neatly fitted and edges beveled.

**FINISH:** All sheet metal receives two or three coats of filler; each coat is rubbed down and one coat color varnish is given for finishing.

Ebony asbestos boards are treated with dead marine finish and the metal top is treated in rust proof bath.



FIG. 1

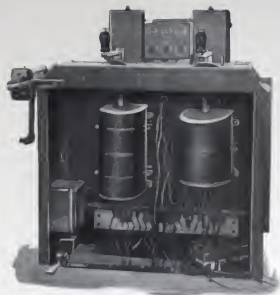


FIG. 2

Fig. 3 illustrates a more complicated form of control for the main operating motors for two vertical lift spans for railroad service, each master controller is interlocked through the signal machine.

The light indications are shown between the two interlocking levers and directly above are shown the Selsyn position indicator and Wattmeter for each span.

A separate control bench similar to Fig. 4 is located back of the operator as he stands facing the controllers. This is for handling all auxiliary circuits, navigation, lighting, etc.

This cut is from a photo of one end of the control room of the Newark Bay Bridge of the Central Ry. of N. J.

There is a similar control stand at the other end of the room, there being four lift bridges in this installation.

Fig. 1 shows a simple type of board for a vertical lift highway span where only one controller is required. Ammeter and voltmeter are mounted on the back of the stand.

Fig. 2 shows a form of control stand for a single leaf railroad type bascule bridge. At the extreme left is mounted the air valve for emergency brake control; the center handle is the master control for two main operating motors and the lever to right is the control for the front lock. On either side of the indicator lamps are the solenoids for electrical interlock of the two drum controllers. This type of stand also provides for a mechanical interlocking bar between the two controllers. In the lower left corner is mounted a foot switch.



FIG. 3

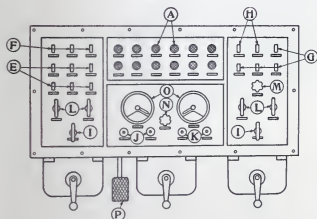
Fig. 4 shows a benchboard for indicator lights, house lights, warning and navigation signal light switches, interlock and power service switches with various fuses mounted under a glass door. The board is built of 1" ebony asbestos mounted on angle iron form and the top is of sheet steel rust proofed. No motor or gate control is mounted on this type of board.



FIG. 4

Fig. 5 This cut shows a complete centralized benchboard control for a two leaf highway bascule bridge both leaves being operated from one side of the river. The body of the board is built of sheet steel and angle iron with a hinged door on either side, the right door gives access to the terminal connectors and light fuses. This board contains the following equipment.

FIG. 5



- A—Indication Lights
- B—Near Leaf Master Controller
- C—Far Leaf Master Controller
- D—Lock Motor Controller
- E—House and Machine Lighting Switches
- F—Warning-Indicator and Navigation Light Switches
- G—Emergency Interlock Release Switches
- H—Heater Switches
- I—Near and Far Side Emergency Brake Switches
- J—Near and Far Side Leaf Limit Release Buttons
- K—Navigation Siren and Horns in Machine Enclosure
- L—Gate Controllers
- M—Control Circuit
- N—Voltmeter Switch
- O—Selsyn Position Indicators
- P—Foot Switch for Seating
- Q—Terminal and Fuse Boards

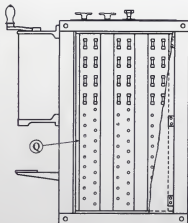
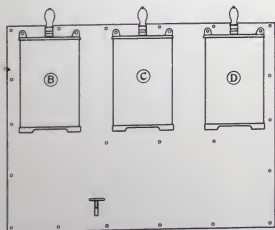


Fig. 6 In this cut is illustrated a very simple form of bench control for a single leaf span with a 5 to 15 H. P. operating motor, no lock motor. The benchboard is complete in that the service switch and motor resistance is mounted thereon. The apparatus contained is:

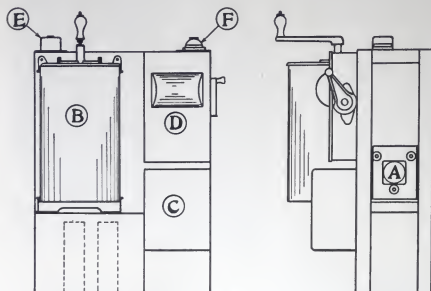


FIG. 6

- A—Motor Resistors
- B—Controller
- C—3 Pole Contractor with Overload Relay
- D—3 Pole Service Switch
- E—Push Button Limits Release
- F—House Light Switch

No ammeter or voltmeter is furnished. Should they be required they may be mounted as shown in Fig. 1. No switchboard is required with this benchboard.

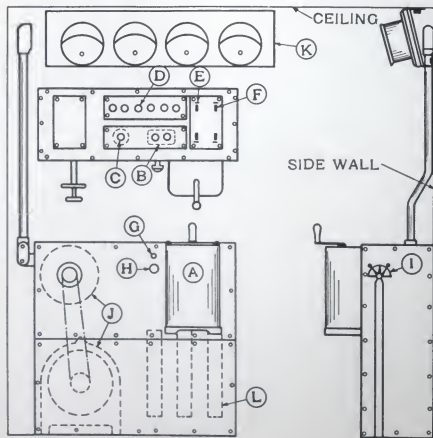


FIG. 7

Fig. 7 shows the control benchboard for the bascule bridge for the Florida East Coast Railway Company's bridge, cut of which is shown on the frontice page of this catalog. In addition to the usual electrical control, the control for an engine generator set is also mounted thereon consisting of the engine motor starter gas and spark control, also the rheostatic control of the dynamo and exciter.

- A—Control Two Operating Motors
- B—Control Lock Motor
- C—Operating Motor Release
- D—Indicator Lights
- E and F—Interlock Release
- G and H—Engine Ignition and Starter
- I—Spark and Gas Control
- J—Rheostats
- K—Meter Panel
- L—Terminal and Fuse Boards





## Limit Switches---Adjustable Drum Type Weatherproof and Dustproof Types

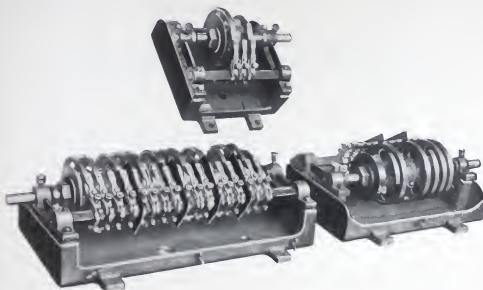
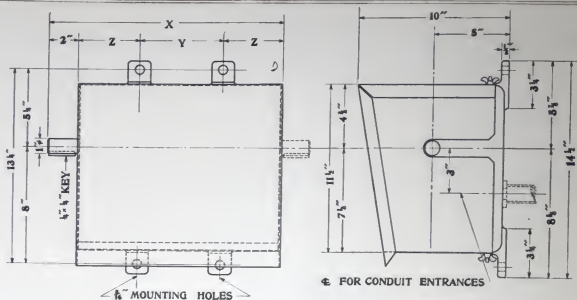


FIG. 1

THESE switches are designed to provide the limits of travel of any movement on a movable bridge, such as raise and lower, lock motor travel and heel lock limits on a bascule type bridge, or the lift or the up and down position and lock on a vertical lift, or the limits on the wedges and end lift on a swing span. On a bascule or lift span the following circuits are usually controlled by the limit switch operated by the main motors: Limits of travel, brakes (one or more), bridge lamps, dynamic breaking (D. C. service), interlocking circuits, or selective circuits for "squeezing down" the span on either raising or lowering.

All rings except the common (the complete circle) are adjustable and can be shifted on the job to secure the desired results. The frame is cast iron, the drum is brass throughout, and all insulating material and spark shields are of bakelite compound. There is no inflammable material used. The finger contacts are renewable and easily adjusted.

This switch is designed to operate through an angle of  $270^\circ$  in either direction of rotation. The angular motion should be between  $260^\circ$  and  $270^\circ$ . The customer should provide a spur or a bevel gear or sprocket and chain drive of such ratio as to permit this angular motion for best results. Switch can be assembled for either right or left hand drive which must be specified on order by customer. Switch will be furnished as shown, viz.: left hand drive unless specified otherwise.



## Data and Prices Weatherproof Type

Model	Max. Weight	Max. Rings	Dimensions			List Prices
			X	Y	Z	
A	125 lbs.	18	26 1/4"	16"	4 1/2"	\$175.00
B	112 lbs.	15	23 3/8"	12 7/8"	4 1/2"	\$157.00
C	100 lbs.	12	19 3/4"	9 5/8"	4 1/2"	\$139.00
D	85 lbs.	8	15 3/8"	5 5/8"	4 1/2"	\$115.00
E	75 lbs.	6	13 7/8"	5 5/8"	3 3/8"	\$103.00

List Price of Intermediate Sizes Compute at \$6.00 per Ring.

## Installation and Maintenance

Open gears and sprocket chains driving limit switches must be covered with protecting guards.

No conduit holes are provided. These holes will be drilled without charge upon receipt of complete information.

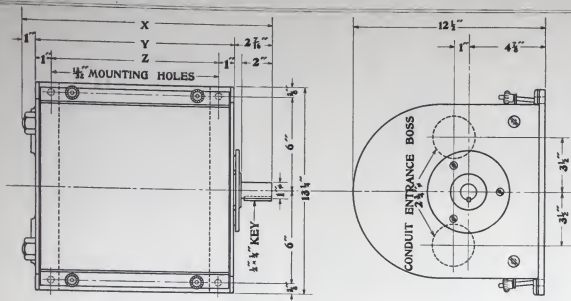
In operation contact rings must be kept clean and all nuts tight.



FIG. 2 DUSTPROOF  
SELECTOR SWITCH



FIG. 3 DUSTPROOF LIMIT SWITCH



## Data and Prices Dustproof Type

Model	Max. Weight	Max. Rings	Dimensions			List Prices
			X	Y	Z	
A-D	115	18	28 11/16"	25"	23	\$185.00
B-D	105	15	25 7/8"	21 7/8"	19 7/8"	\$167.00
C-D	95	12	22 7/8"	18 5/8"	16 5/8"	\$149.00
D-D	87	8	18 5/8"	14 5/8"	12 5/8"	\$125.00
E-D	80	6	16 5/8"	12 5/8"	10 5/8"	\$113.00

List Prices of Intermediate Sizes Compute at \$6.00 per Ring.

Prices quoted herein are for the switch only, provisions must be made for a secure mounting and a positive drive.

## Circuit Selector Switch

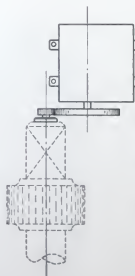
This type of drum switch Fig. 2, is particularly adapted as a circuit selector switch for changing over the auxiliary circuits of a movable bridge from the main current supply to the auxiliary supply and on the control for conveying belts to provide for the various combinations of belts. The one shown in Fig. 2 has eight selective points. Various combinations can be arranged.

*Drum developments furnished for special application on receipt of information.*

For coal or ore handling machinery, these limit switches are provided with dust-proof covers. Special prices made on selector switches.

Secure endorsed prints for construction purposes.

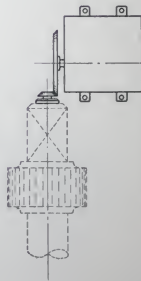
# TYPICAL LIMIT SWITCH APPLICATION



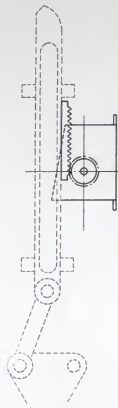
No. 1. SPUR GEAR REDUCTION



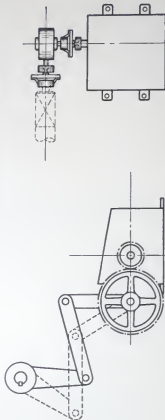
No. 2. DIRECT CONNECTED



No. 3. BEVEL GEAR REDUCTION



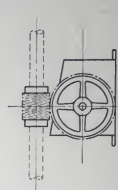
No. 4. RACK & PINION DRIVE



No. 5. LINK & SPUR GEAR DRIVE. No. 7. ENCLOSED WORM GEAR DRIVE



No. 6. CHAIN DRIVE



No. 8. OPEN WORM GEAR DRIVE



# Navigation Warning Signals

## Disc Type Air Whistles--Type A



Size No.	Diameter of Disc	Overall Length	Size of Pipe	Connection	Net Weight, Lbs.	Prices	
						Whistle Only	Whistle & Valve
1	3"	4 3/4"	3/8"	Screw	2 1/2	\$10.00	\$13.00
2	4"	8"	3/8"	"	5	17.50	20.50
3	6"	12"	3/4"	"	16	40.00	44.50
4	8"	13"	1"	Flange	32	-----	95.00

These whistles operate on the principle of a vibrating metallic disc, are of a distinctive tone and may be used for a staccato note which make them valuable as a warning signal. The Consumption of air is only *one fifth* that required by the bell type of whistle for the same carrying distance, one-half mile. These whistles are made of cast bronze and are non-corrosive. The pressure range is quite wide and satisfactory results are obtained without change of adjustment. Working pressure recommended for this service is from 65 to 110 lbs.

## Air Compressor Equipment

For use as a river warning signal outfit where compressed air is not available we offer the following complete plants less the standard pipe and fittings which can be bought locally.

### EQUIPMENT A

- 1—1/2 H. P. direct connected air compressor delivering 2 1/2 cubic feet of free air per minute
- 1—(14x60) 5 cubic feet air tank 110 lb. working pressure
- 1—Safety valve
- 1—Pressure gauge
- 1—Check and Needle Valve
- 1—Drain cock
- 2—Galvanized ground joint unions
- 1—No. 1 or No. 2 whistle and valve
- 1—Unloading valve

Price complete including No. 1 whistle (\$190.00)

Price complete including No. 2 whistle (\$200.00)

### EQUIPMENT B

- 1—H. P. motor, 2 tanks as above, duplex compressor (5 cu. ft.), fittings as indicated

Price complete including No. 3 whistle (\$360.00)

Price complete including No. 4 whistle (\$400.00)

## Single Bell--Steam Type Chime Whistle

This type of whistle may be used where an air plant is installed on the bridge and the consumption of air is no object, also as a distinctive signal in contrast to adjacent bridges. Suitable working pressure 60 to 110 pounds.

The Piston type air whistle listed here is for selective purposes.

Dia. of Bell	Size of Pipe	Price Whistle & Valve	Carrying Distance
1 1/2"	3/8"	\$ 6.50	1/4 mile
2"	1/2"	7.50	1/8 mile
2 1/2"	3/4"	10.00	1/2 mile
3"	3/4"	11.00	3/4 mile
3 1/2"	1"	14.50	1 mile

## Piston Type Whistle

3"	1"	3/4 mile	<b>40.00</b>
4"	1 1/4"	1 mile	<b>59.00</b>

DISCOUNTS ON APPLICATION

# Electrically Operated Warning Signals

## Klaxhorn

The Klaxhorn can be used as a river signal on small highway bridges. It is particularly useful in giving warning to men working about bridge machinery that the bridge is about to be opened, also for other signal call purposes.

This horn can be furnished to operate on electrical current 110 or 220 Volt D. C. and 110 to 440 Volt A. C. The housing is weather proof and is fitted with bracket for wall mounting and is tapped for  $\frac{1}{2}$ " conduit.

Type WL—14 $\frac{1}{4}$ " long—Weight 18 lbs.—Price, \$30.00

## Motor Operated Sirens



TYPE A

TYPE A—This siren is very satisfactory for signaling purposes for distances up to  $\frac{1}{3}$  of a mile and is usually placed in pairs one up and one down stream. They can be furnished for 110 or 220 Volt on either A. C. or D. C. and may be mounted out of doors. Length overall 16 $\frac{1}{2}$  inches; diameter of horn, 14 inches; diameter of body 5 $\frac{3}{4}$  inches; weight 16 lbs.

Price, Type A with universal motor,  $\frac{1}{10}$  H. P., 110 or 220 Volt, A. C. or D. C., ea. \$37.50



TYPE B SINGLE END

### TYPE B

For signaling greater distances up to one mile and in localities where noise is not objectionable this siren is very effective. It cannot be coded as effectively as



TYPE B DOUBLE END

the air whistle but for long blasts can be made very distinctive as a warning signal in contrast to adjacent bridges using air whistles.

These sirens are made in two styles: the single and double ended and can be furnished for 110 to 600 Volt D. C. and 110 to 440 A. C.

For ordinary signaling purposes about a bridge the single head will suffice.

## Prices Single Head

1 $\frac{1}{2}$ H. P. 2 or 3 phase 60 cycle	110 to 550 Volt each	\$290.00
1 $\frac{1}{2}$ H. P. D. C.	110 to 600 Volt each	290.00
2 H. P. single phase 60 cycle	110 to 220 Volt each	300.00
3 H. P. single phase 60 cycle	110 to 220 Volt each	330.00
3 H. P. 2 or 3 phase 60 cycle	110 to 550 Volt each	300.00
3 H. P. D. C.	110 to 600 Volt each	300.00

## Prices Double Head

5 H. P. single phase 60 cycle	110 to 220 Volt each	\$455.00
5 H. P. three phase 60 cycle	110 to 550 Volt each	400.00
5 H. P. D. C.	110 to 600 Volt each	400.00
Remote Control Switches A. C. or D. C. up to 250 Volt each		55.00
Extra push buttons		5.00





